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Roll No .....

BE-3001 (EE/EI/EX)-CBGS

B.E., III Semester

Examination, June 2020

Choice Based Grading System (CBGS)

Mathematics - III

Time : Three Hours

Maximum Marks : 70

Note: i) Attempt any five questions.

ii) All questions carry equal marks.

1. a) Find the Fourier series for $f(x) = e^{-x}$ in $0 < x < 2\pi$.

   b) Find the half range cosine series for the function $f(x) = x$ in $0 < x < \pi$.

2. a) Find the Fourier complex transform of

$$f(x) = \begin{cases} x^2, & |x| < a \\ 0, & |x| > a \end{cases}$$

   b) Find the Fourier cosine transform of $f(x) = e^{-3x} + e^{-4x}$.

3. a) Find $L\{1 + t^{3/2} - 3e^{-2t} + 4\sinh 3t\}$.

   b) Find $L\{e^{-3t}(\sin 2t + \cos 2t)\}$.

4. a) Find $L\left\{\frac{\sin t}{t}\right\}$

   b) Evaluate $L^{-1}\left\{\frac{5s^2 - 15s - 11}{(s+1)(s-2)^3}\right\}$

5. a) Solve $\frac{d^2y}{dt^2} - 2\frac{dy}{dt} + 2y = 0$, given $y(0) = y'(0) = 1$

   b) Evaluate $L^{-1}\left\{\log\left(\frac{s+4}{s+3}\right)\right\}$

6. a) Find the analytic function of which the real part is $u = x^3 - 3xy^2 + 3x + 1$.

   b) Evaluate the integral $\int_0^{1+i} z^2 dz$.

7. a) If $r = 3\hat{i} - 6t^2\hat{j} + 4t\hat{k}$, find $\frac{dr}{dt}$ and $\frac{d^2r}{dt^2}$.

   b) If $r = x\hat{i} + y\hat{j} + z\hat{k}$, show that $\text{grad} r = \hat{r}$.

8. a) Show that $\text{div} r^n r = (n+3) r^n$.

   b) If $F = 3xy\hat{i} - y^2\hat{j}$. Evaluate $\int_C F.d$, where C is the curve $y = 2x^2$ in the *xy*-plane from (0, 0) to (1, 2).

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